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ABSTRACT

Sophisticated heating, electrical sanitation, and recreational systems require more time and concern from school administrators than did their simpler counterparts in the past. The complicated training and workload scheduling of persons charged with actual maintenance operations also require more attention. During the past decade, a body of literature has grown to aid the bewildered administrator in confronting maintenance problems. The 19 documents examined in this review offer techniques for managing and maintaining a clean, safe, and pleasant school building. (Author)

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Building Maintenance

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In the days of the one-room schoolhouse, physical plant maintenance occupied little of the school administrator's time and effort. In today's school buildings, complex heating, electrical, sanitation, and recreational systems require management emphasis.

The purposes of school maintenance are to promote health and safety, provide the best possible environment for teaching and learning, minimize time loss, increase the building's functional life, and promote good school-community relations. Certainly not least important in maintenance management is the objective of achieving economic operating costs. Sharply rising costs in all areas are causing architects and builders to pay more attention not only to construction of buildings but to maintenance characteristics of the finished structure.

Training and workload scheduling of persons charged with actual maintenance operations have also acquired increased importance in the school system. The work of the custodial team is responsible for the health and safety of building occupants, affects the external appearance of the school, and has a formative influence on pupils.

Not until the past decade has the need for administrative guidance in maintenance management been realized in the form of instructive literature.

The nineteen documents reviewed here consider school maintenance under five broad headings: general discussion of

maintenance management; custodial services; maintenance of grounds, floors, and lighting; operation and maintenance of mechanical systems; and preventive maintenance systems. Many include bibliographies.

All except four of these documents are available from the ERIC Document Reproduction Service. Complete instructions for ordering these documents are given at the end of the review.

MAINTENANCE MANAGEMENT

In one publication of a series dealing with school plant management, Finchum (1964) outlines maintenance functions and procedures for the components of school buildings. He discusses maintenance needs in three broad categories: exterior, interior, and mechanical systems. Exterior maintenance is concerned with preserving exposed surfaces, such as walls, roofs, windows, and doors. Interior maintenance encompasses all the services required to keep the inside of the building safe, pleasing, and usable, and includes surfaces and finishes, doors and windows, fixed equipment, and fire protection and safety. Mechanical systems maintenance is concerned with heating, ventilation, electrical, and sanitary facilities. Appendixes include a bibliography, a glossary, a building maintenance survey, and a list of manufacturers' organizations who assisted with the publication.

Area-by-area discussions of the components of new educational buildings and the problems that can occur in their use are presented in a report of the Council of Educational Facilities Planners (1968). The document surveys methods for avoiding maintenance and operation troubles and emphasizes the responsibility of the educational facility planner to learn as much as he can about the building he controls.

The Louisiana State Department of Education (1962) outlines methods for preserving, protecting, and keeping buildings, grounds, and equipment in satisfactory operating condition. Detailed information is offered on the maintenance of interior and exterior facilities and the problems of fire prevention, including the development of a good fire prevention program. Recommendations include standardized maintenance procedures and techniques and a centralized school service center.

A computerized system for maintenance management is described by Berry and Roberson (1967) in terms of its components—inventory control, scheduling of custodial work, preventive maintenance, new work, and review and analysis. A flow chart for the system shows the interrelation of the components and the details of each. Sample printouts include equipment data, repair data, work performance data, work instruction, accounts, and payout items. The document answers various questions of interest to potential users of the system and suggests a procedure for developing a similar system.

CUSTODIAL SERVICES

The importance and responsibilities of the school custodian, custodial personnel policies, general school housekeeping duties, restroom cleaning techniques, and operation and care of mechanical equipment are considered in another publication of the Louisiana State Department of Education

(1963). An extensive bibliography of books, periodicals, and bulletins concerned with school maintenance is included.

A training course for school custodians prepared by the Florida State Department of Education (1965a) outlines the most efficient and modern methods for cleaning and sanitizing school facilities. Topics discussed include orientation and definitions, basic bacteriology and chemistry, cleaning and sanitizing methods, and pest control. A bibliography is provided.

The Kentucky State Department of Education (1967) directs its guidelines for school maintenance to the local school situation where the custodian has neither the opportunity for any formal training nor experienced personnel available to instruct him. Topics include floor care and cleaning of carpets, classrooms, corridors and stairs, cafeterias, auditoriums, windows, ceilings and walls, lighting fixtures, window shades, furniture, chalkboards, tackboards, and building exteriors. The manual also includes discussions of storage, water supply systems, heating and ventilating equipment, summer cleaning programs, and a bibliography.

In a survey report of school plant management for Escambia County, the Florida State Department of Education (1965b) analyzes data collected on maintenance and operation of school plants in relation to organization, administration, budgeting, expenditures, purchasing, staffing, warehousing and distribution, maintenance shops, administrative practices, performance standards, and efficiency. The report states basic purposes of a school maintenance and operations program, makes recommendations, and includes worksheets for estimating custodial personnel requirements and daily workloads.

Haugo and Mohrenweiser (1968) analyze the allocation of funds to operation and maintenance and the individual custodial workloads in the Suburban Park School District in Minneapolis, Minnesota. The report divides maintenance and operation expenditures into three categories—plant maintenance expenses, custodial salaries, and operation expenditures above and beyond custodial salaries—and compares them with national norms.

The authors analyze allocation of workloads for custodial staff members in terms of efficiency, management's demand for custodian's time, and equalization of duties among custodians. A mathematical model facilitates administrative decision-making in relation to maintenance equipment financing and manpower utilization. In addition, the model investigates the interchange of men and machines in the floor-scrubbing and water-pickup processes.

The study recommends reevaluating the work assignments and task efficiencies of custodians, maintaining present custodial staff size, reassigning individual custodial workloads to promote equalization of assigned duties, and purchasing the optimum mix of cleaning machines.

A guide by Pryor (1967) is designed to assist superintendents and school business officials in evaluating and allocating custodial workloads. Part I illustrates a method for equalizing custodial workloads, using a representative employee's performance as a model for measuring the workloads of other employees. The administrator is shown how to select this representative employee, gather the evaluative data, and interpret the results.

Part II presents a method (the factoring formula) for determining the proper size of the custodial staff. Factors to be taken

into account include the number of rooms, the number of pupils, the floor area, the size of the school grounds, and available equipment. The guide provides examples taken from an actual study conducted in suburban Minneapolis.

Maintenance of Grounds, Floors, and Lighting

In a report devoted to external grounds maintenance, Bruning (1963) discusses site size and accessibility, topography, exposure, and soil conditions. He also gives consideration to site planning, maintenance materials, lawn development, and selection of maintenance equipment.

Care and replacement of flooring in schools is the subject of an article by Smalley (1966). The paper describes detailed methods for repairing various types of flooring material, including damaged resilient and linoleum tiles, cracked and pitted terrazzo and marble, and cupped, buckling, and broken boards.

The American Carpet Institute (1963) reports on installation and maintenance costs of carpet, tile, and terrazzo in a wide variety of commercial installations. To provide prospective floor-covering buyers with comparative use-cost data in chart form, over four hundred thousand square feet of carpeted floors and over one million square feet of noncarpeted floors were examined and evaluated. Use cost is determined by three points of evaluation—installation costs, maintenance costs, and durability. The study concludes that carpeting costs more than other flooring to install but lasts longer and requires less maintenance. Total use costs of carpeting are reported to run from 40.8 percent to 47.6 percent less than for noncarpeted floors.

Finchum (1965) surveys floors, lighting, sanitation, and safety in his discussion of operation and maintenance procedures for multipurpose school gymnasiums. He recommends a renovation procedure for a gymnasium floor that is slightly warped or is in need of complete renovation and considers gymnasium lighting systems in terms of quality of illumination, replacement, and cleaning. Sanitary maintenance of floors, shower stalls, water closets, urinals, lavatories, and drinking fountains auxiliary to a gymnasium receives specific attention. Brief mention is made of the maintenance functions that might prevent falls and those that contribute to safe, orderly evacuation in case of fire or explosion.

Allphin (1965) discusses the basic principles and circuitry of the most commonly used lamp types. In addition to identifying troubleshooting and cleaning techniques, his guide surveys economical lighting systems and lighting fundamentals, and includes incandescent, fluorescent, and mercury lamps.

Operation and Maintenance of Mechanical Systems

Larson and Rust (1968) present the results of a one-year survey of mechanical equipment in Minnesota to determine the present condition and level of performance of operating mechanical equipment, the problems encountered by school administrators and custodial engineers pertaining to operating mechanical equipment, and the general level of competence exhibited by custodial engineers. The program consisted of a preliminary investigation followed by

establishment of an advisory committee, a questionnaire, and an on-site visit.

The results indicate a high percentage of mechanical equipment in need of repair, poor heating practices in many buildings, water chemistry associated with boiler operation in need of attention, a lack of preventive maintenance programs, and a need for additional maintenance training. The study recommends the addition of an engineering staff to the school-plant planning section of the department of education, the establishment of training programs, and the preparation of a maintenance procedure manual. The report includes a short bibliography.

Muller (1961) reviews the problems of regulation and maintenance of heating, ventilating, and air conditioning equipment in multibuilding situations that prompted the development of an automatic monitor and control system at Harvard University. The addition of more buildings, the installation of more complex systems in existing buildings, and the growing demand for year-round environmental control increased the workload and the need for better utilization of manpower.

As a solution, automatic controls, thermostats, time clocks, and valves were installed wherever possible on existing equipment, and sensors and some remote controls were connected to a central control console, aided by a series of schematic drawings on slides keyed into the controls. The report describes the resulting readjustment in manpower allocation and procedures, with implications for improved service and reduced costs, and indicates problems needing further attention and research.

PREVENTIVE MAINTENANCE

A handbook by Daniel (1966) outlines a planned preventive maintenance program consisting of an operational system designed to increase the effectiveness of the maintenance staff and the use of funds through efficient scheduling of inspections and follow-through of work to be performed. Sections for the chief administrative officer, the chief business officer, and the supervisor of maintenance suggest systems and procedures for the implementation of a preventive maintenance program. Other sections cover the specifics of the plan and suggestions for putting the program into full or partial operation.

The Honeywell Corporation (1967) offers a pamphlet on preventive maintenance of automatic controls, heating, ventilating, and air conditioning systems. Preventive maintenance provides more efficient operation, fewer breakdowns, annual budgeting, extended equipment life, diagnosis of weak points, and advance determination of equipment replacement. The guide compares inplant maintenance with contract service, concluding that contract service is preferable, and describes several of the maintenance plans offered by the company. Advantages of the Honeywell services include (1) budgeting of all maintenance for the year, (2) reduction of breakdowns and emergency service, (3) parts and replacements kept in stock, (4) availability of trained specialists, (5) tools, test equipment, and other supplies otherwise kept in inventory, and (6) complete records kept on all equipment.

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